

Reflections on the triple helix as a vehicle to stimulate innovation in technology and security – a Belgian case study

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Abstract

In this contribution the main argument is that a triple helix collaboration between industry, government and knowledge institutes can be a vehicle to stimulate innovation and technology in the field of safety and security. To underpin this argument the significance of the evolution from a state model to a triple-helix model is described as well as the paradigm of open innovation that is a necessary condition for the triple-helix model. Relying on experiences since 2014 with the Belgian Innovation Centre for Security reflections are made on the dynamics of the triple-helix collaboration taking into account its creation, objectives, ambition, methodology, partners and funding. Some of the (perceived) barriers encountered and logics used by government, as one of the 'hesitating' participants in the triple-helix collaboration, are further discussed.

Key Words: triple-helix, innovation, technology, security, safety, Belgium

Introduction

In Europe and indeed around the world, the security sector is seen as one of the sectors with the most potential for growth in employment and turnover (BVBO, 2012; CoESS, 2013). Over the past decade, safety and security issues have undergone a fundamental change. Supervisory and surveillance tasks are ever more rapidly evolving towards traditional on-site surveillance by deploying security staff with mobile security, which are backed up by technological and electronic equipment (CoESS, 2013). The traditional 'system and technology

solutions' consisted of cable laying, camera positioning and routine surveillance service planning. Nowadays, when it comes to supporting businesses with their security challenges, there are high expectations with regard to securing the cloud and handling Big Data and smart solutions (mobile and integrated) (Marti, 2011). In a large-scale survey of 28 EU Member States, Bosnia-Herzegovina, Macedonia, Norway, Serbia, Switzerland and Turkey, conducted by the Confederation of European Security Services (CoESS), 92.31% of respondents said they expected to see positive growth in technological applications in the safety and security markets. According to 92.31% of the respondents, there will be solid growth in pooled technology, ICT and security staff services, whereas according to 53.85%, the traditional security and surveillance market will shrink, thus appearing to be in decline.

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In recent years, the field of security in Belgium has seen a great many technological initiatives and innovative developments. For example, several local police forces have taken the initiative to deploy new technologies such as ANPR (Automatic Number Plate Recognition), drones and/or unmanned cameras. These initiatives typically begin as a local initiative, which results in a much broader spread. On the one hand, this is positive, because it reveals the flexibility of local police forces when it comes to technology and innovation. On the other hand, however, it is a drawback, because the initiatives' local character does little in the way of encouraging the technological and innovation learning process among other police forces. Fire services are embracing innovation too, turning to 'smart' clothing, which integrates sensors and communication devices into the protective clothing, or experimenting with the potential to deploy drone technology during fire-fighting events. The opportunity to stimulate cross-sector innovation is not being fully exploited. In other words, too little knowledge is being exchanged within and between organisations (Easton & Dormaels, 2016).

It is worth noting that a great many of these security-related initiatives take shape through bilateral partnerships. These are largely local security actors from the public sector who partner with private sector actors, businesses which generate new products and services in the fields of technology and innovation. One example would be the police zone of MidLim (As, Genk, Houthalen-Helchteren, Opglabbeek, Zutendaal) which partnered with a drone company and became the first zone to deploy drone technology. Rarely in Belgium do partnerships arise involving the state, industry and academia when it comes to innovation and technological development in the field of security (Dormaels & Easton, 2016).

One exception to this is the Innovation Centre for Security, the non-profit organisation INNOS², which was established in 2014 and acts as a Belgian intermediate organisation that stimulates innovation and technology partnerships between industry, government and knowledge institutes in the field of security. The interaction among these three actors forms the foundation of the triple-helix model. Below, we explain the significance of the evolution from a state model to a triple-helix model (2). Then, we go on to outline the paradigm of open innovation as a necessary condition for the triple-helix model coming to full fruition

2 www.innos-center.be

(3). We also take a close look at the complex workings of the triple-helix model (4). After that, we describe the creation, objectives, ambition, methodology, partners and funding of the Innovation Centre for Security in Belgium. Finally, based upon our experiences³ at the innovation centre, we reflect on the triple-helix as a vehicle for spurring on innovation and technology in the field of security.

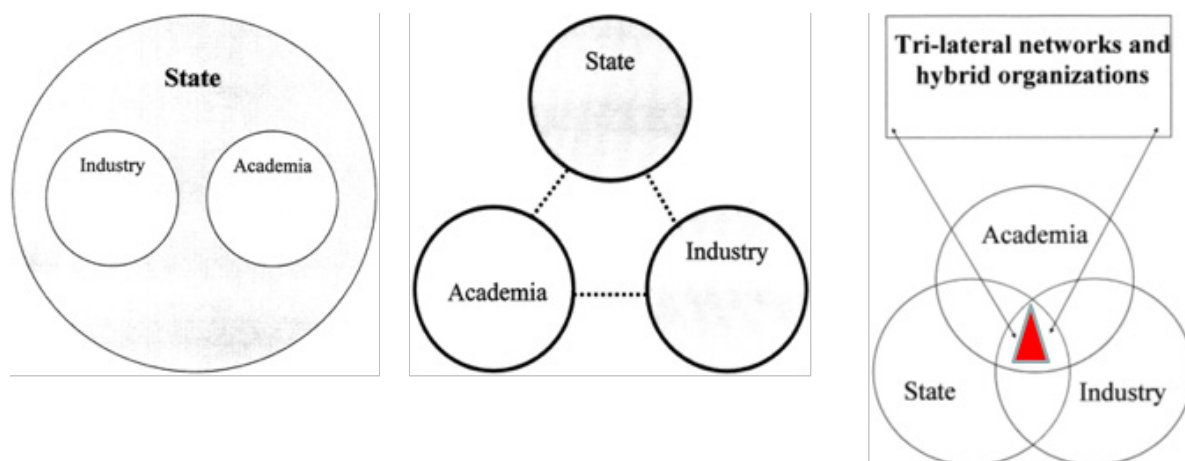
The evolution from a State Model to a Triple-helix Model

When we consider the models available to us on the creation of technological innovation, we come across the triple-helix concept, which made its debut in the 1990s and was introduced by Etzkowitz and Leydesdorff (Etzkowitz, 1993; Etzkowitz & Leydesdorff, 1995). The concept has been described as: 'The interaction among university, industry and government.' (Etzkowitz, 2008: 1) and can be situated on the evolutionary line from *state model* to *laissez-faire model* to *triple-helix model*, which is depicted in Figure 1 below and briefly explained thereafter.

The most significant institutional pillar of the so-called state model is government, to which industry and knowledge institutes are subordinate. The government governs relations between these actors and takes the lead in any projects or new initiatives. These institutional spheres are a fair distance apart. The downside to this model is the lack of bottom-up initiatives, which stifles innovation. In the laissez-faire model (middle of the illustration above), the government, industry and knowledge institutes operate autonomously and independently of each other. In other words, there are clear boundaries, as a result of which interaction, and therefore innovation, is limited. The triple-helix model (to the far right in the illustration above), implies cooperation and interaction between knowledge institutes, industry and government. The purpose of this intensive cooperation is to promote innovation and, through a mutual exchange of knowledge and experience, bring about economic growth. As a consequence of this, the model provides a means by which to analyse innovation in a knowledge economy. In addition, it can also be seen as a workable model for steering processes of innovation (Etzkowitz & Ranga, 2013).

3 This experience consists of four years of participation in the functioning of the Innovation Center for Security (vzw INNOS) as president (Marleen Easton) of this non-profit organization.

Figure 1: Evolution from a state model to a laissez-faire model to a triple-helix model (compilation of models from Etzkowitz, H., 2008).



At the heart of the triple helix lies the issue of constructing an entrepreneurial state in which knowledge institutes, industry and government can jointly innovate in response to current economic challenges in any number of policy areas. The triple-helix concept is underpinned by the thesis that in a knowledge economy the potential for innovation and economic development resides in the interaction between knowledge institutes, government and industry. That very interaction, the model's Achilles' heel, is seen as the source of new, innovative organisational forms and social interactions, which stimulate the production, transfer and application of knowledge (Ranga and Etzkowitz, 2013:239).

The triple-helix partnership is also thought to have the potential to resolve the so-called 'innovation paradox'. The paradox exists in the sense that knowledge institutes' research activities do not align with private sector innovation needs (SERV, 2011; Flemish Government, 2014:13). Indeed, the same paradox exists in respect of public sector needs for innovation. The paradigm of open innovation is thus essential for spurring on interaction between the three institutional spheres (government, industry and knowledge institutes).

The Paradigm of Open Innovation

A precondition to a full appreciation of the triple helix is the paradigm of open innovation. *'By open innovation we mean close collaboration by all stakeholders (businesses, citizens, universities, financial institutions and other*

intermediate organizations) in addressing a business and social opportunity or challenge. Engaging with each other through multiple channels and pooling their internal resources; including knowledge, finance, people, markets and data.... It is about co-innovating and co-creating.' (Anderson & Hutton, 2013:4). Chesbrough⁴ (2006:15) argues that 'open innovation' deserves its status as a new paradigm because external knowledge is employed; because there is a new perspective on successful innovation (not merely organisation-specific) and because intermediate organisations have emerged and other measurement tools have been developed to monitor an organisation's innovation.

In other words, open innovation is about sharing knowledge (= power) in partnership and in interaction with others. It is about open interaction between disciplines, sectors, organisations and professions. The 'boundaries' are, as it were, deliberately exceeded. A process is put in place which is at once practically oriented and theoretically based, and this brings us to what is known as 'evidence-based co-created public policy'. The ability to develop this rests on active commitment of the stakeholders and partners involved, a commitment of resources (personnel, money, equipment and infrastructure) and high-quality employees and leaders/managers, who are able to set up the networks⁵.

⁴ Chesbrough Henry is executive director Center for Open Innovation, Walter A. Haas School of Business, University of California, Berkeley, USA.

⁵ www.biginnovationcentre.com

Mutual confidence is crucial to bringing all of this about in practice. Given that the parties in the triple helix (government, industry and knowledge institutes) each have their own structural and cultural identity, it is important that they get to know one another, demonstrate mutual understanding and communicate clearly. Moreover, a shared interest is needed to create and maintain a 'balanced' triple helix at the very least (Smits, 2011).

Europe also encourages the concept of 'open innovation', and even takes it a step further with its 'open innovation 2.0', which rests on a Quadruple Helix Innovation Model. In addition to government, industry and knowledge institutes, the quadruple helix involves citizens. The end users are involved at the start of the innovation process to create a stronger impact (including societal impact), or this is the idea at any rate. In other words, it is not just about open innovation, but about participative innovation. This sort of participation takes shape in the so-called Living Labs, in which a *public-private-people* partnership (PPPP) is created and social innovation is considered alongside technological innovation⁶. But whether and how the impact will be felt in practice is very much a matter of wait and see. Keeping a healthy critical eye on the process seems absolutely appropriate here. After all, the triple helix's workings are complex. In the following section we consider a few of the model's core dynamics.

The Workings of the Triple-helix Model

Figure 2 below introduces the complex workings of the triple helix. We introduce a few of the main dynamics, but the list is by no means exhaustive. Etzkowitz makes a distinction between circulation at the macro level (between actors) and at the micro level (within each institutional sphere). The first form leads to partnership, projects and networking between the actors involved, whereas the second consists of output from each individual actor (Etzkowitz, 2007: 8). In other words, it requires circulation of flows *within* and a circulation of flows *between* universities/knowledge institutes, industry and government. Below, we focus on circulation of flows between the actors involved, in that our contribution is about the stimulation of interaction between these actors.

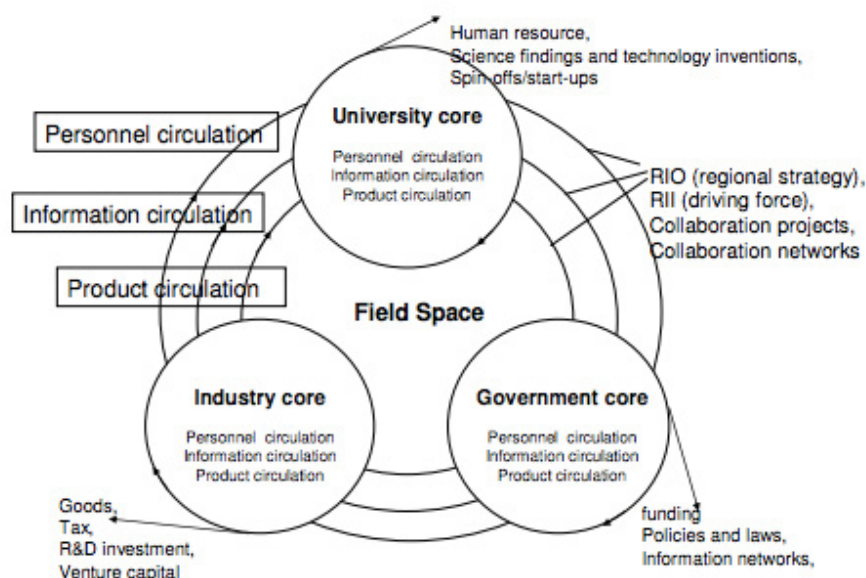
If we zoom in on the workings of the triple helix, Figure 2 tells us that the circulation of people, information and output is a crucial factor in generating interaction between the actors (Etzkowitz, 2007).

The triple-helix model recognises the importance of people (academics, policy-makers, students, entrepreneurs and business angels) as individual innovators. Within this model Ranga and Etzkowitz draw a distinction between the innovative organiser and the enterprising academic, among others. The innovative organiser takes a key position in one of the institutional spheres and exerts the influence needed to bring government, industry and knowledge institutes together. He or she takes the initiative to coordinate top-down and bottom-up processes, initiatives and stakeholders, with a view to developing new ideas, promoting economic and social development and winning support for accomplishing innovations (Ranga and Etzkowitz, 2013:242). The enterprising academic seeks to harmonise the research activities with the needs of the market and government. This results, among other things, in the establishment of spin-off organisations and sale of patents, but also includes the accumulation of knowledge about how technology impacts organisational processes (Ranga and Etzkowitz, 2013:243). In other words, the enterprising academic offers a response to the aforementioned innovation paradox.

It is clear that individual innovators (innovative organisers and enterprising academics) step outside of their traditional roles, which are linked to their institutional context, whether it be industry, government or knowledge institutes. This is precisely why the boundaries between the actors involved become blurred in this sort of triple-helix partnership. In any event it facilitates better circulation of people, ideas, knowledge and capital. This openness stimulates flexibility, creativity and innovation (Ranga and Etzkowitz, 2013). Specifically, the circulation of people can be achieved in several ways. It can be done through a permanent shift from one sphere to another. A professor, for example, can become a full-time business entrepreneur. What's more, there is also the potential to combine two positions, for example to have a part-time or full-time appointment at a university, along with a part-time position in industry or government. For example, a practitioner might be appointed part-time to a university to conduct research or prepare his or her doctoral dissertation. It could also happen that a person transfers to another sphere where he or she enjoys relative success before returning to his or her

⁶ <https://ec.europa.eu/digital-agenda/en/open-and-participative-innovation>

Figure 2: Triple helix circulation (Etzkowitz, 2007:9).



previous position. According to Ranga & Etzkowitz this dynamic can break down 'parochial thinking' and generates empathy within the triple-helix model.

At the same time, this blurring of the boundaries can be a source of conflict, particularly from the demands which stem from a traditional perspective on roles within an institution's own context. At universities, for example, professors are judged on their publications and funded research projects, and not so much on the relationships they develop with other disciplines, businesses and government based on their expertise. On the other hand, it is about the traditional government view of partnership with industry, and the limitations that government experiences in this form of partnership as a result of the public procurement legislation. Finally, seeing the direct added value and return on investment through partnership with government and knowledge institutes is a challenge for many businesses.

Figure 2 also clearly illustrates the need to actively stimulate information flows between the actors in the triple helix. This is because partnership relies on communication and information. Nowadays information and communication technologies provide a wealth of opportunities to share information and stay up-to-date on potential new developments. These information networks must be actively set up in the triple helix (Etzkowitz, 2007:

10). An organisation's traditional seminars, workshops and newsletters are a valuable start, but more intensive forms of exchange based on specific software, Dropbox, WeTransfer or email are sorely needed. It is essential that these flows be organised and maintained. After all, they do not appear of their own volition.

Finally, the exchange of output is important. This deals with the outcome of a partnership. Output must, by necessity, create a win-win situation for every actor involved. Moreover, equivalent contribution to the outcome is fundamental: *'If there is a negative imbalance in contributions; a gap might appear in innovation: conversely a positive imbalance might stimulate other actors to increase their efforts.'* (Etzkowitz, 2007:10). In light of the preceding information it is vital that freerider behaviour in these partnerships be avoided at all times. It is, in and of itself, a challenge to find ways of preventing this behaviour.

To facilitate the circulation of people, information and output, Ranga & Etzkowitz tell us that space is required for knowledge development, innovation and consensus (Ranga & Etzkowitz, 2013). *Space for knowledge* is created when knowledge institutes and resources are in adequate supply. These can throw up technological ideas and fuel regional development. *Space for innovation* implies that knowledge institutes, governments and businesses exchange skills and knowledge on a regular basis,

which can result in innovative new ideas. Specifically, this could be set up in a science park, a cooperative research group or a centre for excellence in a particular field. H-STAR, at Stanford University, is a specific example of this (<http://hstar.stanford.edu>). As an interdisciplinary research institute it aims to serve as a crossroad for people, expertise, projects and programmes that blends human sciences with research and innovation in information technology. In this innovation space the development of a separate Triple Helix organisation has a major role to play in bringing knowledge institutes, governments and businesses together. This institute can set up, manage and encourage subsequent cooperation between the three actors. *Space for consensus* implies that each party involved is assured of the partnership's benefits and added value. This is because the actors must have an interest in common if a balanced triple helix is to be created. The outcome must be a win-win situation for everyone. In addition, the presence of a sense of urgency is a prerequisite to achieving a productive partnership.

These 'spaces' are not formed the same way in every policy domain, region or country and are often triggered by the local or regional needs specific to the relevant actors partnering in the triple-helix model. These needs reveal the actors, relationships, resources and new institutional forms required. The creation of a triple-helix partnership thus depends to a considerable degree on the actors' motivation to participate in joint projects, which is easier said than done. It calls for a seismic shift in an organisation's way of thinking. *'This is not an easy process, as setting joint agendas often involves a major change of vision, crossing organizational silos, thinking beyond the boundaries of a single institutional sphere, harmonizing institutional and individual objectives, resources and cultures, etc.'* (Ranga & Etzkowitz, 2013).

The Innovation Centre for Security in Belgium (INNOS vzw)

INNOS was set up as a non-profit organisation on 28 July 2014, by individuals from the private sector, the public sector and knowledge institutes, i.e., the so-called partners in the triple-helix model. In practice, Securitas and Betafence joined forces with the support of the West Flanders Development Agency, the Provincial Security Services Training Centre (POV, Zedelgem) and local police, represented by the chiefs of police in the local Westkust and Ypres police zones. The initiative also received support from knowledge institutes from Prof. Dr. Paul

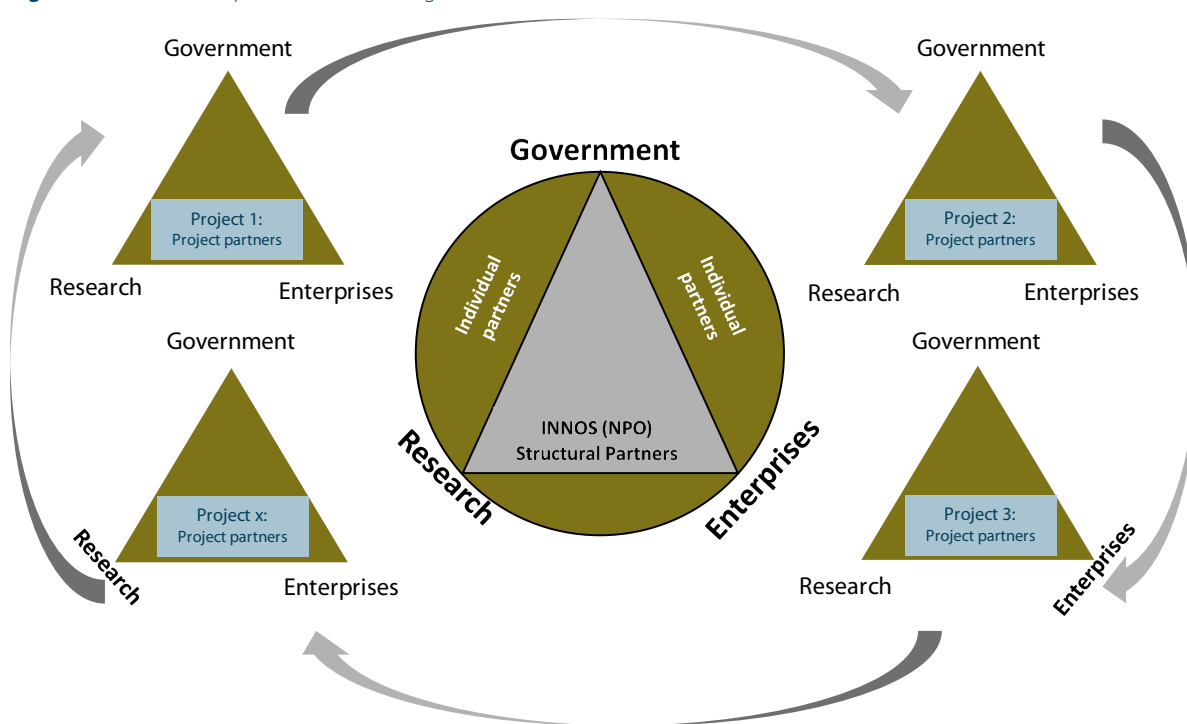
Ponsaers of the Centre for Police Studies (CPS), Evelien De Pauw (VIVES) and Prof. Dr. Marleen Easton (Ugent).

These partners came together through a desire to help find an answer to three obstacles to technology, innovation and security in Belgium (Dormael & Easton, 2015a, Dormael, Moons, Easton, 2016). The first of these obstacles being the observation that, irrespective of the field, society is reluctant to accept new approaches, products and technologies. In other words, an effort has to be made to get innovations established, a point against which the field of security is not immune. A second sticking point is the observation that Belgian businesses (including the security sector, with a few exceptions) tend to be very conservative, so that innovation is fairly scarce and no (national) strategy has been developed to book progress in this area (Haïd, 2014). A third difficulty is the observation that the actors in the field of security are often short on market insight, with the result that current technologies are under-exploited, as are opportunities for innovation. Public sector actors, for example, are not always aware of how recently developed technologies from the private sector can optimise their work processes, in managing information flows, for example.

INNOS has set itself the goal of responding to the fundamental security challenges in the area of new technologies, social innovation and integrated security. The Innovation Centre runs projects to simplify the introduction of innovative products, services and applications. In this way a contribution to the development of knowledge and a contribution to the development of the economy take place simultaneously. Finally, INNOS contributes to the social and economic clout of the public/private security sector, while at the same time bringing greater efficiency to the security actors' collective pursuit of a safer society (Dormael & Easton, 2015a). INNOS vzw was not however set up for commercial purposes, nor does it broker contracts between government and industry. INNOS occupies an explicitly intermediate role in the heart of a triple-helix model, which is geared towards interaction between governments, businesses and knowledge institutes. The diagram below illustrates the network structure which arises as a result.

Based on this interaction, the innovation centre unites knowledge and needs in the field of safety and security, and multidisciplinary knowledge and innovation projects are produced in the fields of new technologies, social innovation and integrated security. In this

Figure 3: INNOS as a triple helix network organisation



manner, INNOS combines the expertise of each of its partners and generates a win-win situation for all those involved (Dormael & Easton, 2015b). In its first two years of operation, INNOS has shown that triple-helix projects can yield good, innovative solutions. For example, INNOS created an ad hoc command post during the administration of the First World War commemorations in Nieuwpoort (Dormael & Easton, 2015 and 2016)⁷. The method was found useful not only for the commemorations, but also for security in relation to other events, such as the Tomorrowland festival (Barco, 2016) and E3 Harelbeke cycling race (Noppe, Dormael & Easton 2016). Additionally, INNOS deals with the exchange of knowledge and identification of needs. For example, it organised a seminar on critical infrastructure security and a seminar involving workshops designed to stimulate interaction between industry, government and knowledge institutes in the areas of technology, innovation and security (Dormael

⁷ VIPs from 83 countries were invited to this international ceremony. The project resulted in the creation of an ad hoc command post, which was set up on a piece of land in the ceremony's vicinity. The expertise and partnership between Barco, Securitas and the police services led to an innovative solution. Several sources of information (mobile camera images, helicopter images, radio communication, social media data) were exchanged in real time between the Westkust and Ypres police zones, the Federal Crisis Centre and between various emergency services, such as the fire service and emergency medical services.

& Easton, 2015a). In other words, INNOS has a very wide range of activities.

The 'Triple-helix DNA' is crucial in the work of INNOS. This means that partners are drawn from each of the institutional spheres (industry, government and universities) for every activity. For example, in the aforementioned ad hoc command post, multiple sources of information (mobile camera images, helicopter images, radio communication, social media data) were exchanged in real-time between the Westkust and Ypres police zones, the Federal Crisis Centre and several emergency services, such as the fire service and emergency medical services. At the same time, the knowledge institutes went on to study how this exchange of information affected the information flow, Dormael & Easton (2015c). If an activity does not meet the 'Triple-helix DNA' criteria it is passed over and will undoubtedly go to another organisation within the field of security.⁸ In other words, the triple helix is the common thread uniting the INNOS network. The am-

⁸ The members of the INNOS Board of Directors decided that the 'Commemoration of the Battle of Waterloo' did not qualify as an innovation project because it did not satisfy the conditions for a triple-helix partnership. The management role lay squarely with a private organiser, government participation had not been finalised and the project involved no added value from knowledge institutes' input.

bition is to become the point of reference for technology, innovation and integrated security by 2020.

At start up, INNOS vzw was unable to rely on government funding with the exception of individual membership by the West Flanders Development Agency. The first two years of operation were funded almost exclusively by the private sector. Through structural funding, Securitas, Betafence and Barco made it possible to set the organisation up in the first place. Although these companies conceived the idea of the innovation centre alongside representatives from government and the knowledge institutes, they also bankrolled the staff in order to make the centre a reality. Thus, the non-profit organisation INNOS was created from the bottom up, without state support.

Below, we reflect on the specific workings of the triple helix and the questions it generates, with reference to our experience at the Innovation Centre for Security over the last two years. We devote the greater share of our attention to the government point of view, because this partner is often 'hesitating' and 'holding back' from participating in this initiative.

Reflections on the Belgian triple-helix cooperation

A major reason for the government to withhold support from the INNOS non-profit is partially due to the complex structure of the Belgian state, which gives a great many government authorities the potential to play a role in the realm of technology, innovation and security. The federalisation of Belgium has turned innovation policy (to name but one of many factors) into a patchwork of programmes and initiatives. Added to this is the complexity involved in the process of actually steering security policy, with powers delegated to the federal state, the regions, communities and local authorities. This is because federal, regional, subregional and local authorities are saddled with the responsibility of security in Belgium, in which they are confronted with the future challenges of technology and innovation. There are a number of federal public services (FPS) involved, such as the FPS for Information and Communication Technology, the FPS Interior, FPS Justice, FPS Mobility and Transport and the Ministry of Defence. Moreover, each of the local mayors is responsible for the administration of his or her local police service and emergency relief zone (fire service) and has

special powers when it comes to the enforcement of public order. The Flemish Government also has powers in the area of innovation, exercised by a minister who is also responsible for employment, economy and sport.

A partnership between industry, government and knowledge institutes also touches on the relationship between market and government. A so-called 'entrepreneurial state' is needed to enable innovation and entrepreneurial spirit and to keep it going in the long term. This also applies to the policy domain of security and to the various authorities with security powers in that domain within the Belgian state structure. At first sight there is no easily identifiable entity to take up the gauntlet. Belgium has a need for an entrepreneurial and, perhaps more importantly, networking government, one that can make itself felt at the central and decentralised levels alike. Moreover, it fits in seamlessly with the network structure which is central to the current activities of INNOS.

Given that Belgium currently does not have an entrepreneurial, networking government (read: combination of different administrative levels), which profiles itself in the domain of technology and innovation in the field of security, bottom-up initiatives such as INNOS vzw, which is primarily funded by the private sector, are viewed with a certain degree of suspicion. The question is often raised, and rightly so, as to whether INNOS is supply-driven or demand-driven. To put it another way, the question is one of whether INNOS facilitates the placement of new services and technology on the market for business by creating needs among end users, or whether innovation arises from needs among end users, which then translate into innovation projects. In order to answer to this question it is often speedily assumed that because INNOS is largely privately funded it must surely exclusively pursue economic profit on the basis of supply-driven operations. However, this assumption overlooks a number of elements.

Although INNOS does not receive structural funding from the government, the Board of Directors does reflect the 'triple-helix DNA'. This means that the Board of Directors is composed of private partners and representatives from the local police, fire service and knowledge institutes. The nature of this composition is crucial in answering any question in relation to supply-driven or demand-driven innovation. This is because the composition of the Board of Directors

ensures that innovation is demand-driven, on the basis of societal challenges in the field of security, and not 'merely' supply-driven to create a sales market for existing technology. The 'triple-helix DNA' indeed means that a balance is sought between the two, and it is found in the pursuit of win-win scenarios for industry, government and knowledge institutes. If a business is uncomfortable with this, it is asked to refrain from participating in the triple helix. As are governments and knowledge institutes that are uncomfortable with the idea of bringing to the market the results of innovation projects with which they are involved.

One specific example of a demand-driven innovation project is the INNOS pilot project. INNOS brought government, industry and knowledge institutes together in response to the specific needs expressed by the Westkust and Ypres police zones. Barco and Securitas were responsible for setting up an ad hoc command post by employing 'open' technology applications, in which various ICT platforms and CCTV systems were integrated. This project was accomplished in a period of six weeks. This type of result is only possible when businesses are given a clear understanding of the needs of government and are prepared to incorporate existing applications and services into a single final project. In this manner a balance was found between demand-driven and product-driven innovation.

The significance of these demand-driven projects should not be underestimated. In such cases the success of an innovation project cannot only be measured in terms of the pure economic return for the private partners alone. Indeed, it also includes improved service (e.g. decisions taken and communicated more rapidly) or a justification in terms of personnel or resources. An evaluation of the pilot project, for example, shows that the use of technology brings personnel savings of about 25%. In other words, the pursuit of innovation not only requires an investment by the party requesting it, it can also pay that party back. In this case, police capacity can be freed up for other tasks and redirected towards service (or better service) for the population. It also immediately justifies government investment in innovative solutions and offers a clear return on investment.

This is why it is so important for government to come to the table and help identify the challenges that face the field of security, for which innovative solutions must be sought. When government participates in the

innovation process, often as an end user, it becomes a co-owner of the innovation process. This means that innovations can be set up and tested more rapidly through projects, and that the effect of the technology on the regulatory framework can be more readily identified. It leads to a quicker implementation of technology and innovation in response to security issues. As a result, services are more extensive, come to market sooner and contribute towards security solutions. The mission to simulate better security in society through a triple-helix organisation will then contribute indirectly to economic growth.

The operation of INNOS shows that co-investment is needed from government and industry, and that a return on investment is needed by both parties if the initiative is to create and retain its credibility over the long term. Our experience at INNOS puts into perspective the notion that in Europe (Mazzucato, 2013) there is too much 'state', not enough market and a lack of entrepreneurial culture. The Innovation Centre for Security was created from the bottom up by the entrepreneurial culture of the actors involved and with the majority of its financial support derived from a few businesses. It is now up to the government to show its entrepreneurial spirit at various levels of the Belgian state structure, and to take up the gauntlet too, to give the triple helix a better chance in the long term. This implies funding, but it also implies involvement and open dialogue with all partners. After all, it is a way of shaping the current and future challenges in technology, innovation and security.

Our experience in the setting up of specific projects through INNOS has taught us that action on specific challenges and issues can only be taken if a certain degree of harmonisation is reached in the awareness, motivation, methodology and rewards available for each of the actors involved. This piece of the puzzle must fit if we are to generate real impact in technology and innovation in the field of security. There is also no single actor that should take up the gauntlet alone to face this challenge. Our experience has shown us that where there is a will, there is a way that will lead to innovation.

Where budget is concerned, the triple-helix logic faces a serious challenge in the future. It is not so much to do with the available amount of budgetary room for manoeuvre, it is more to do with a recurrent budget being obtained that covers basic funding: a budget

with a balanced composition, based on the membership of the triple-helix partners (government, knowledge institutes and private businesses), which are seen as its founding partners. From this platform, additional funding can be sought in relation to specific issues, for which projects will be set up.

To conclude we are aware of the fact that there is a need for more comparative international research to get insights on the true added value of the triple-helix model for stimulating innovation and technology in the field of security. The study of the rise, the goals, the ambitions, the work processes, the partners and

the funding of different initiatives in different nations can teach us something about the impact of politics and socio-economic conditions on the development of triple-helix collaborations around the world. Possible initiatives to be studied are the Dutch Institute for Technology, Safety and Security; the Safety Lab in the West Cape in South Africa and the Australian Research Council Centre of Excellence in Policing and Security to name a few. This kind of research can generate a more solid answer to the question whether the triple-helix can be a vehicle for stimulating innovation and technology in the field of security and what the necessary conditions and possible dynamics are.

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